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PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS: Bredt *et al.*
SERIAL NO.: 09/835,292 GROUP NO.: 1714
FILING DATE: April 13, 2001 EXAMINER: Matthew Thexton
TITLE: COMPOSITIONS FOR THREE-DIMENSIONAL PRINTING OF
 SOLID OBJECTS

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

THIRD PRELIMINARY AMENDMENT

Please enter the following Preliminary Amendment after entry of the Response to Notice of Non-Compliant Amendment filed herewith and before beginning examination of the above-identified patent application.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 11 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims

1. (Currently amended) A chemical composition comprising:
~~a nonaqueous organic monomeric compound~~solvent,
wherein the chemical composition is adapted to be deposited using an electromechanical printhead to selectively adhere particulate material to form a solid object in a three-dimensional printer.
2. (Currently amended) The composition of Claim 1, wherein the ~~compound~~solvent ~~includes at least one of~~ is selected from the group consisting of an alcohol, an ester, an ether, a silane, a vinyl monomer, an acrylic monomer, or a methacrylate ~~a nonaqueous organic monomeric compound~~, and combinations thereof.
3. (Currently amended) The composition of Claim ~~[[1]]~~2, ~~comprising a solvent and a solute, and~~ wherein the ~~compound~~ solvent ~~comprises~~ [[is the solvent]] ~~a nonaqueous organic monomeric compound~~.
4. (Currently amended) The composition of Claim ~~[[3]]~~2, wherein the solvent ~~includes~~comprises an alcohol.
5. (Currently amended) The composition of Claim 4, wherein the alcohol is selected from the group consisting of methyl alcohol, ethyl alcohol, isopropanol, [[or]]-butanol, and combinations thereof.
6. (Currently amended) The composition of Claim ~~[[3]]~~2, wherein the solvent ~~includes~~comprises an ester.

7. (Currently amended) The composition of Claim 6, wherein the ester ~~includes at least one of~~ is selected from the group consisting of ethyl acetate, dimethyl succinate, diethyl succinate, dimethyl adipate, ~~[[or]]ethylene glycol diacetate, and combinations thereof.~~

8. (Currently amended) The composition of Claim ~~[[2]]41~~, wherein the ~~compound includes~~ solvent comprises a mixed vinyl-silane monomer.

9. (Currently amended) The composition of Claim 8, wherein the mixed monomer ~~includes~~ comprises vinyltriisopropoxysilane.

10. (Currently amended) The composition of Claim ~~[[2]]41~~, wherein the acrylic monomer ~~includes at least one of~~ is selected from the group consisting of tri(propylene glycol) diacrylate, ethylene glycol phenyl ether acrylate, ~~[[or]]1,6 hexanediol diacrylate, and combinations thereof.~~

11. (Currently amended) The composition of Claim ~~[[2]]41~~, wherein the methacryl~~[[ic]]ate~~ monomer ~~includes at least one of~~ is selected from the group consisting of 1,3 butylene glycol dimethacrylate, neopentyl glycol dimethacrylate, butyl methacrylate, 1,6 hexanediol dimethacrylate, ~~[[or]]di(propylene glycol) allyl ether methacrylate, and combinations thereof.~~

12. (Currently amended) The composition of Claim 1, wherein the ~~compound~~ solvent is curable by ultraviolet radiation, in combination with a photoinitiator, to form a solid, ~~by ultraviolet radiation having a wavelength between about 320-500 nm and an energy density of about 1 joule/cm².~~

13. (Currently amended) The composition of Claim 1, wherein the particulate material comprises a resin and the compound is composition comprises a solvent for ~~[[a]]the resin in the particulate material.~~

14. (Currently amended) The composition of Claim 13, wherein the resin ~~includes at least one of~~ is selected from the group consisting of shellac, polyvinyl

pyrrolidone, polyvinyl acetate, polyvinyl alcohol, polystyrene, styrene-butadiene copolymer, [[or]]acrylonitrile-butadiene-styrene copolymer, and combinations thereof.

15. (Currently amended) The composition of Claim 1, wherein the particulate material ~~includes~~ comprises a filler ~~that includes an inorganic compound.~~

16. (Currently amended) The composition of Claim ~~[[15]]~~48, wherein the ~~filler~~ includes at least one of inorganic compound is selected from the group consisting of clay, aluminum oxide, silicon dioxide, aluminum silicate, potassium aluminum silicate, calcium silicate, calcium hydroxide, calcium aluminate, calcium carbonate, sodium silicate, zinc oxide, titanium dioxide, [[or]]magnetite, and combinations thereof.

17. (Currently amended) The composition of Claim 15, wherein the particulate material further comprises~~[[ing]]~~ a printing aid ~~dispersed throughout the filler.~~

18. (Currently amended) The composition of Claim 17, wherein the printing aid includes at least one is selected from the group consisting of sorbitan trioleate, sorbitan mono-oleate, sorbitan monolaurate, polyoxyethylene sorbitan mono-oleate, polyethylene glycol, soybean oil, mineral oil, propylene glycol, fluoroalkyl polyoxyethylene polymers, glycerol triacetate, polypropylene glycol, ethylene glycol octanoate, ethylene glycol decanoate, ethoxylated derivatives of 2,4,7,9-Tetramethyl-5-decyne-4,7-diol, oleyl alcohol, [[or]]oleic acid, lethicin, and combinations thereof.

19. (Currently amended) A binder chemical composition comprising for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder composition including
an adhesive; and in combination with
a fluid,
wherein the adhesive comprising a nonaqueous organic monomeric compound the chemical composition is adapted to be deposited using an electromechanical printhead to selectively adhere particulate material to form a solid object in a three-dimensional printer.

20. (Canceled)

21. (Currently amended) ~~[[A]]The chemical composition of Claim [[19]]57 for selectively adhering particulate material to form a solid object in a three-dimensional printer, the composition including an adhesive in combination with a fluid, the adhesive comprising an~~ wherein the anionically ionizable polymer consisting of compounds is selected from the group including ~~consisting of~~ polymethacrylic acid, polymethacrylic acid sodium salt, ~~[[and]] sodium polystyrene sulfonate, and combinations thereof.~~

22. (Canceled)

23. (Currently amended) The composition of Claim ~~[[22]]57~~, wherein the cationically ionizable polymer is selected from the group consisting of ~~includes~~ polyethyleneimine, ~~[[and]] polydiallyldimethylammonium chloride, and combinations thereof.~~

24. - 25. (Canceled)

26. (Currently amended) The composition of Claim ~~[[25]]57~~, wherein the nonionic polymer includes at least one is selected from the group consisting of polyvinyl pyrrolidone, polyvinyl pyrrolidone copolymer with polyvinyl acetate, polyvinyl alcohol, polyvinyl methyl ether, polyacrylamide, ~~[[or]] poly-2-ethyl-2-oxazoline, and combinations thereof.~~

27. - 29. (Canceled)

30. (Currently amended) A chemical composition ~~for selectively adhering particulate material to form a solid object in a three-dimensional printer, the adhesive comprising:~~

~~a waterborne~~ colloid selected from the group consisting of polymethyl methacrylate, polystyrene, natural rubber, polyurethane, polyvinyl acetate, alkyd resins, colloidal alumina, clay, colloidal graphite, and combinations thereof,

wherein the chemical composition is adapted to be deposited using an electromechanical printhead to selectively adhere particulate material to form a solid object

in a three-dimensional printer.

31. (Currently amended) ~~A binder.~~ The chemical composition of Claim 56 for selectively adhering particulate material to form a solid object in a three-dimensional printer, the binder including an adhesive in combination with a fluid, the adhesive comprising a polymer wherein the colloid is selected from the group consisting of polymethyl methacrylate, polystyrene, natural rubber, polyurethane, polyvinyl acetate, [[and]] alkyd resins, colloidal alumina, clay, colloidal graphite, and combinations thereof.

32. (Currently amended) ~~[[A]]~~ The chemical composition of Claim 56, wherein for selectively adhering particulate material to form a solid object in a three-dimensional printer, the adhesive comprising an the inorganic solute is selected from the group consisting of sodium silicate, sodium polyphosphate, sodium hydrogen phosphate, sodium hydrogen pyrophosphate, sodium tetraborate, ammonium hydrogen phosphate, sodium chloride, ammonium nitrate, potassium sulfate, ammonium chloride, [[and]] calcium formate, and combinations thereof.

33. - 40. (Canceled)

41. (New) The composition of Claim 3, wherein the nonaqueous organic monomeric compound is selected from the group consisting of a silane, a vinyl monomer, an acrylic monomer, a methacrylate monomer, and combinations thereof.

42. (New) The composition of Claim 12, wherein the solvent is curable by ultraviolet radiation having a wavelength selected from the range of about 320 nanometers to about 500 nanometers.

43. (New) The composition of Claim 12, wherein the solvent is curable by ultraviolet radiation having an energy density of about 1 joule/cm².

44. (New) The composition of Claim 12, wherein the solvent comprises a polymerizable monomer.

45. (New) The composition of Claim 44, wherein the polymerizable monomer is selected from the group consisting of a silane monomer, a vinyl monomer, an acrylic monomer, a methacrylate monomer, and combinations thereof.

46. (New) The composition of Claim 45, wherein the methacrylate monomer is selected from the group consisting of 1,3 butylene glycol dimethacrylate, neopentyl glycol dimethacrylate, butyl methacrylate, 1,6 hexanediol dimethacrylate, di(propylene glycol) allyl ether methacrylate, and combinations thereof.

47. (New) The composition of Claim 45, wherein the acrylic monomer is selected from the group consisting of tri(propylene glycol) diacrylate, ethylene glycol phenyl ether acrylate, 1,6 hexanediol diacrylate, and combinations thereof.

48. (New) The composition of Claim 15, wherein the filler comprises an inorganic compound.

49. (New) The chemical composition of Claim 19, wherein the fluid comprises water.

50. (New) The chemical composition of Claim 19, wherein the fluid comprises a nonaqueous liquid.

51. (New) The chemical composition of Claim 50, wherein the nonaqueous liquid is selected from the group consisting of alcohol, ester, ether, resin, oil, and combinations thereof.

52. (New) The chemical composition of Claim 51, wherein the nonaqueous liquid comprises an alcohol.

53. (New) The chemical composition of Claim 52, wherein the alcohol is selected from the group consisting of methyl alcohol, ethyl alcohol, isopropanol, t-butanol, and combinations thereof.

54. (New) The chemical composition of Claim 51, wherein the nonaqueous liquid

comprises an ester.

55. (New) The chemical composition of Claim 54, wherein the ester is selected from the group consisting of ethyl acetate, dimethyl succinate, diethyl succinate, dimethyl adipate, ethylene glycol diacetate, and combinations thereof.

56. (New) The chemical composition of Claim 19, wherein the adhesive is selected from the group consisting of a polymer, a colloid, an inorganic solute, and a nonaqueous organic monomeric compound.

57. (New) The chemical composition of Claim 56, wherein the polymer is selected from the group consisting of an anionically ionizable polymer, a cationically ionizable polymer, a nonionic polymer, and combinations thereof.

58. (New) The chemical composition of Claim 56, wherein the nonaqueous organic monomeric compound is selected from the group consisting of a silane, a vinyl monomer, an acrylic monomer, a methacrylate monomer, and combinations thereof.

59. (New) A chemical composition comprising:
a nonaqueous liquid selected from the group consisting of a resin, an oil, and combinations thereof,
wherein the chemical composition is adapted to be deposited using an electromechanical printhead to selectively adhere particulate material to form a solid object in a three-dimensional printer.

60. (New) A particulate material adapted for three-dimensional printing, the particulate material comprising:
a plurality of filler particles; and
a plurality of adhesive particles,
wherein the filler particles are coated with at least a portion of the adhesive particles.

61. (New) The particulate material of claim 60, wherein the adhesive particles are adapted to selectively adhere when combined with a chemical composition comprising ethyl acetate.

62. (New) A chemical composition comprising:
a solvent selected from the group consisting of an alcohol, an ester, an ether, and combinations thereof,
wherein the chemical composition is adapted to be deposited by a printhead to selectively adhere particulate material to form a solid object in a three-dimensional printer.

63. (New) The composition of Claim 62, wherein the alcohol is selected from the group consisting of methyl alcohol, ethyl alcohol, isopropanol, t-butanol, and combinations thereof.

64. (New) The composition of Claim 62, wherein the ester is selected from the group consisting of ethyl acetate, dimethyl succinate, diethyl succinate, dimethyl adipate, ethylene glycol diacetate, and combinations thereof.

65. (New) A chemical composition comprising:
an adhesive including a nonionic polymer; and
a fluid,
wherein the chemical composition is adapted to be deposited using a printhead to selectively adhere particulate material to form a solid object in a three-dimensional printer.

66. (New) The chemical composition of Claim 65, wherein the fluid is selected from the group consisting of water, a nonaqueous liquid, and combinations thereof.

67. (New) The chemical composition of Claim 66, wherein the nonaqueous liquid comprises ethyl acetate.

68. (New) The chemical composition of claim 65, wherein the nonionic polymer is selected from the group consisting of polyvinyl pyrrolidone, polyvinyl pyrrolidone copolymer with polyvinyl acetate, polyvinyl alcohol, polyvinyl methyl ether, polyacrylamide, poly-2-ethyl-2-oxazoline, and combinations thereof.

REMARKS

Claims 1-33 are pending; claims 34-40 have been previously withdrawn in response to a restriction requirement. Applicants hereby cancel claims 20, 22, 24-25, 27-29, and 33-40. New claims 41 - 68 have been added. After entry of this amendment, claims 1-19, 21, 23, 26, 30-32, and 41-68 will be pending.

Claims 1-19, 21, 23, 26, and 30-32 have been amended to more clearly define the invention. Support for the amendments and new claims may be found in the originally filed claims, as well as in paragraphs 20, 41, 49, and 57-73. No new matter has been added.

At least claims 1, 2, 6, 7, 12-19, 21, 23, 26, 30-32, 42-48, 50, 51, 54-62, and 64-68 read on the elected species of ethyl acetate.

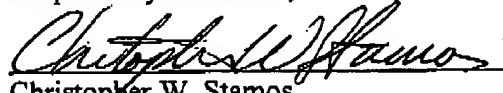
Applicants believe that an extra claim fee of \$234.00 is necessitated by the present Amendment. Applicants hereby authorize the Commissioner to charge this fee to Deposit Account No. 20-0531. The Commissioner is hereby also authorized to charge any other fees that may be necessitated by the present Amendment to Deposit Account No. 20-0531.

If the Examiner believes that a telephone conversation with Applicants' attorney would expedite prosecution of this application, the Examiner is cordially invited to call the undersigned attorney at (617) 248-7026.

Date: 15 October 2004
Reg. No. 35,370

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Respectfully submitted,


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